SCVWD Comments on Volume 3 Chapters 2,4,7,8,9

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To: DWR CWP Comments
Attachments: Comments on Vol3_Ch02_AgWU~1.pdf (331 KB) ; Comments on Vol3_Ch04_Floo~1.pdf (366 KB) ; Comments on Vol3_Ch07_Syst~1.pdf (338 KB) ; Comments on Vol3_Ch08_Wate~1.pdf (330 KB) ; Comments on Vol3_Ch09_Conj~1.pdf (492 KB)

Here are the Santa Clara Valley Water District's comments on California Water Plan Update 2013 Volume 3, Chapters 2,4,7,8, and 9.

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21. Review and adopt standard water use efficiency approaches to meet water needs during dry years. New approaches should be explored such as alfalfa summer dry-down and regulated deficit irrigation to cope with water shortages.
22. Drought water management should be fully incorporated in agricultural water management plans.

Department of Water Resources' Near-Term Core Programs

23. Continue developing a single standardized water use reporting form, in consultation with the State Water Resources Control Board, the Department of Food and Agriculture, Department of Public Health, and Public Utility Commission. Agricultural water suppliers will use the form is to report water use data and information.
24. Continue developing an on-line submittal portal for water suppliers to use in reporting water use data, EWMPs, and AWMPs.
25. Prepare and submit reports on the results of efficiency improvements in irrigation systems to the Legislature.
26. Make all submitted agricultural water management plans available for public inspection on the DWR Web site.
27. Prepare and submit to the Legislature reports summarizing the status of the Agricultural Water Management Plans and adoption by the agricultural water suppliers. These reports shall be prepared on or before December 2013 and in subsequent years ending with six and one, e.g., 2016, 2021.

Agricultural Water Use Efficiency in the Water Plan

[This is a new heading for Update 2013. If necessary, this section will discuss the ways the resource management strategy is treated in this chapter, in the regional reports and in the sustainability indicators. If the three mentions are not consistent, the reason for the conflict will be discussed (i.e., the regional reports are emphasizing a different aspect of the strategy). If the three mentions are consistent with each other (or if the strategy is not discussed in the rest of Update 2013), there is no need for this section to appear.]

References

References Cited

Agricultural Water Management Council AB 3616 Advisory Committee. 1999. Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California. Sacramento (CA): California Department of Water Resources. 87 pp. Viewed online at: http://www.agwatercouncil.org/images/stories/pdfs/awmcmou.pdf.

CALFED Bay-Delta Program. 2000a. Programmatic Record of Decision (ROD). Sacramento (CA): CALFED Bay-Delta Program. 846 pp. Viewed online at: http://www.calwater.ca.gov/content/Documents/ROD.pdf.

———. 2000b. "Water use efficiency program plan. Programmatic EIR/EIS technical appendix." Sacramento (CA): California Bay-Delta Program. 29 pp. [Web site.] Viewed online at: http://calwater.ca.gov/calfed/library/Archive_EIS.html.

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Number: 1 Author: trachemm Subject: Sticky Note Date: 11/27/2013 2:58:51 PM
Water suppliers should have some input into the form. It should also be consistent with reporting requirements under the CVPIA.

- **Channels and bypasses.** Channels and bypasses convey floodwaters to reduce the risk of slow-rise, flash, and debris-flow flooding. Channels can be modified by deepening and excavating the channel to increase its capacity, or lining the streambed and/or banks with concrete, riprap, or other materials to increase drainage efficiency. Channel modifications can result in increased erosion downstream, degradation of adjacent wildlife habitat, and often require extensive permitting. Bypasses are structural features that divert a portion of flood flows onto adjacent lands or into underground culverts to provide additional flow-through capacity and/or to store the flows temporarily and slowly release the stored water.
- **Retention and detention basins.** Retention and detention basins are used to collect stormwater runoff and slowly release it at a controlled rate so that downstream areas are not flooded or eroded**.** A detention basin eventually drains all of its water and remains dry between storms. Retention basins have a permanent pool of water and can improve water quality by settling sediments and attached pollutants.
- **Culverts and pipes.** Culverts and pipes are closed conduits used to drain stormwater runoff. Culverts are used to convey streamflow through a road embankment or some other type of flow obstruction. Culverts and pipes allow stormwater to drain underground instead of through open channels and bypasses.
- **Coastal armoring structures, shoreline stabilization, and streambank stabilization.** Coastal armoring structures and shoreline stabilization reduce risk to low-lying coastal areas from flooding**.** Coastal armoring structures are typically massive concrete or earthen structures that keep elevated water levels from flooding interior lowlands and prevent soil from sliding seaward. Shoreline stabilization reduces the amount of wave energy reaching a shore or restricts the loss of beach material to reduce shoreline erosion rates. Types of shoreline stabilization include breakwaters, groins, and natural and artificial reefs. Streambank stabilization protects the banks of streams from erosion by installing riprap, matting, vegetation, or other materials to reduce erosion.
- **Debris mitigation structures.** When debris and alluvial flooding occur, Sabo dams, debris fences, and debris basins separate large debris material from debris flows, or they contain debris flows above a protected area. These structures require regular maintenance to periodically remove and dispose of debris after a flood. Deflection berms or training berms can be used to deflect a debris flow or debris flood away from a development area, allowing debris to be deposited in an area where it would cause minimal damage.

Reservoir and Floodplain Storage and Operations

- **Reservoir and floodplain storage.** These provide an opportunity to regulate flood flows by reducing the magnitude of flood peaks occurring downstream. Many reservoirs are multipurpose and serve a variety of functions including water supply, irrigation, habitat, and flood control. Reservoirs collect and store water behind a dam and release it after the storm event. Floodplain storage occurs when peak flows in a river are diverted to adjacent offstream areas. Floodplain storage can occur naturally when floodwaters overtop a bank and flow into adjacent lands, or storage can be engineered using weirs, berms, or bypasses to direct flows onto adjacent lands.
  - **Storage operations.** This optimizes the magnitude and timing of reservoir releases. Storage operations can reduce downstream flooding by optimizing the magnitude or timing of reservoir releases, or through greater coordination of storage operations. Coordination can take the form of formal agreements among separate jurisdictions to revise reservoir release operations based

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Number: 1 Author: trachemm Subject: Sticky Note Date: 11/25/2013 3:52:19 PM

Retention basins do not necessary have a permanent pool of water. Rather they infiltrate the water rather than releasing it back into the channel. Retention basins also have the potential degrade groundwater quality by infiltrating polluted surface water.

Number: 2 Author: trachemm Subject: Highlight Date: 11/25/2013 3:49:19 PM

- **Surface storage.** Most of California's major surface water reservoirs are managed for multiple purposes including water supply, hydropower, water quality, recreation, and ecosystem needs as well as flood management. Increasing local and regional surface storage has the potential to provide greater water management flexibility for capturing runoff and controlling flood flows.
- **System reoperation.** The primary goal of forecast-coordinated and forecast-based operations is to improve downstream flood protection while improving, or at least not degrading, water supply, environmental, or recreational uses through better hydrologic forecasting and coordinated reservoir operations.
- **Outreach and education.** Regular outreach is needed to educate the public on flooding, flood risks, floodproofing, and impacts of climate change, as well as to explain what households, businesses, and communities can do to reduce or mitigate risk to acceptable levels. Outreach is also needed to educate the public on natural beneficial functions of floodplains.
- ~~**Recycled water.** Storm flows can be captured and used as a recycled water source for a variety of uses. However, the impaired quality of these flows can lead to unintended consequences. For example, irrigation and groundwater recharge with recycled water can lead to damaged foliage, diminished infiltration rates, and increased runoff in some cases.~~

Resource management strategies that could directly benefit from natural functions of flooding include the following strategies:

- **Ecosystem restoration.** Floodplain environments are dynamic in nature and are highly productive biological communities, given their proximity to water and the presence of fertile soils and nutrients. California native riparian and aquatic animal and plant communities are adapted to conditions of seasonal flooding. Many other terrestrial plants and animals use riparian areas for forage and movement across the landscape. The principal opportunities for improvement in both flood management and ecosystem restoration occupy the same spatial footprint and are affected by the same physical processes that distribute water and sediment in rivers and across floodplains.
- **Pollution prevention.** Floodplains that function well improve water quality by filtering impurities and nutrients, processing organic wastes, controlling erosion and sedimentation of streams, and moderating temperature fluctuations.
- **Water-dependent recreation.** Protecting and enhancing public access to rivers, lakes, and beaches increases public safety, fosters environmental stewardship, and increases economic sustainability of flood management projects. Flood management infrastructure must be designed to protect public trust uses such as navigation and recreational access to the state's waterways and beaches. Flood protection facilities, natural floodplains, and restored areas can improve recreational access to waterways by providing opportunities for integrating suitable recreation facilities.
- **Recharge area protection, conjunctive management, and groundwater storage.** Diversions of flood flows for groundwater infiltration can reduce downstream flooding and improve water supply by storing groundwater as well as providing water for conjunctive use. The generally flat topography of natural floodplains and the permeable nature of alluvial soils promote infiltration into the subsurface for storage in soils and aquifers.

Potential Benefits

Primary benefits of flood management are derived from the potential to reduce risks to lives and property from flood events and increase flood resilience, which reduces social and economic disruption and flood recovery costs. Flood management also provides beneficial opportunities for water supply, environmental

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Number: 1 Author: trachemm Subject: Cross-Out Date: 11/25/2013 4:05:07 PM

Number: 2 Author: trachemm Subject: Sticky Note Date: 11/25/2013 4:06:44 PM

In the context of the CWP RMS, recycled water is recycled municipal wastewater rather than storm flows. The discussion about the potential adverse impacts is appropriate for municipal recycled water but not storm flow.

restrictions by pursuing exemptions to existing statutes for public safety. For example, changes to current laws (e.g., Proposition 218) could include reclassification of flood management agencies as exempted public safety utilities. The roundtable also could pursue establishment of regional assessment districts.

3. **By 2017, State and federal agencies should expand processes for developing, funding, and implementing flood management projects with an IWM approach in each region.**. The use of IWM would promote and encourage incorporation of project components that achieve a broader range of objectives. Also, this would result in development of a common terminology for State and federal programs to help grantors and grant recipients understand IWM processes.
4. **By 2020, DWR should add compliance with best management practices and other statuary requirements for land use as a criterion for making flood management funding decisions.** Land use policies that keep new development out of floodplains and encourage compact, low-impact development can reduce costs of flood management projects.
5. **By 2017, working with the California Emergency Management Agency (CalEMA) and other State agencies, DWR should provide grant funding for increased coordination among flood responders, facility managers, planners, tribal entities, and representatives of State and federal resource agencies to improve flood emergency preparedness**. Coordination before a flood event improves emergency preparedness by identifying and reinforcing areas of expertise, available resources, and agreement about plans.
6. **State and federal agencies should establish more stable sources of funding to assist local and regional collaboration, including IRWM.**
7. **By 2020, the State should develop broad-based public funding to support recreational facility planning, construction, and O&M in flood protection projects as required by California Water Code Sections 12840-12842.**

Develop and Disseminate Adequate Data and Tools

8. **DWR should ensure that guidelines, tools, and technical assistance for an IWM approach include best management practices for flood management by 2017**. Improved guidelines and technical assistance would provide tools and incentives for local implementation.
9. **DWR should provide technical assistance to local flood management agencies that encourage an IWM approach.** Improved guidelines and technical assistance would provide tools and incentives for local implementation.
10. **Local, State, and federal agencies should work together to develop methodologies and data to perform regional risk assessments across the state by 2020.** These efforts will provide flood management agencies at all levels with the data and tools necessary to establish and achieve appropriate levels of flood protection. Goals should be based on the number of lives and value of property at risk, degree of urbanization, number of critical facilities, type of flood, and level of acceptable risk for the region.
11. **DWR, academic institutions, USACE, U.S. Geological Survey (USGS), and the National Oceanic and Atmospheric Administration (NOAA) should build on studies currently underway to develop a climate change report by 2017.** The report would focus on climate change and its impacts on flood hydrology, concentrating on local extreme events instead of average precipitation and temperature changes. Such a report would be valuable because it would provide additional localized information to the State and would address water and flood-related issues that will be affected by climate change, understanding that flooding is impacted more by extreme events and that potential future impacts might be more severe.

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Number: 1 Author: trachemm Subject: Highlight Date: 11/25/2013 4:14:24 PM

Number: 2 Author: trachemm Subject: Sticky Note Date: 11/26/2013 8:47:40 AM

This doesn't work when the primary flood management agencies doesn't have land use powers. For instance, in Santa Clara County, the Santa Clara Valley Water District is the primary flood management agency but we don't have land use authority. We shouldn't be ineligible for funding because we don't have land use authority.

- California's priority system for surface water rights, including area-of-origin water rights, presents complications for large-scale changes.
- Contractual obligations for water deliveries largely constrain the operations of many projects.
- Flood rule curves mandate the reservation of flood control space during the flood season. Changing rule curves would require congressional approval, which is a difficult and time-consuming process.
- Coordinated operating agreements already govern the operation of multiple projects (e.g., the agreement that governs SWP and CVP operations).
- Changes in federal project purposes require congressional approval.

Integrating Water Resource Management

California water resources management involves many tiers and players. Facilities are operated for local, regional, or nearly statewide beneficial uses. Implementing large-scale system reoperation would involve a combination of regulatory actions by local, regional, State, and federal agencies.

Planning, Design, and Implementation Costs

As mentioned earlier in this chapter, significant up-front and ongoing costs can be involved with system reoperation, as with the planning, design, and implementation of any large-scale infrastructure project.

Up-front planning and design costs might include such items as data collection, hydrologic and hydraulic model development, decision support systems development, and environmental documentation necessary just to evaluate the benefits and impacts of proposed reoperation strategies through the feasibility study level. Tangible implementation costs would be associated with the actual removal, modification, or construction of any infrastructure.

Water management agencies might have difficulty raising needed funds for feasibility-level studies and implementation due to existing contracts or regulations that prohibit them from increasing water or energy rates. As with implementing any large-scale project, selling the project costs to those directly in line to receive benefits is a foregone necessity.

Recommendations

The following recommendations can help facilitate reoperation to meet water supply reliability, flood management, hydropower, water quality, ecosystem, and other objectives better.

1. State, federal, regional, and local agencies should collaborate on large-scale system reoperation studies to pool resources and share benefits.
2. The State and federal water operators should encourage and expand the use of forecast-based and forecast-coordinated reservoir operations.
3. The State should take the lead to establish a baseline hydrology applicable to large-scale system reoperations modeling.
4. The State should fund reoperation studies of smaller regional water purveyors through the Integrated Regional Water Management Grant Program.
5. The State should take the lead and develop an integrated water resources analytical tool to support regional and statewide system reoperation analysis that balances water supply, flood protection, water quality, and ecosystem needs. This tool would make the State a leader in large-scale integrated water management.

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Number: 1 Author: trachemm Subject: Highlight Date: 11/26/2013 1:42:04 PM

Number: 2 Author: trachemm Subject: Sticky Note Date: 11/26/2013 1:44:52 PM

Some local/regional agencies have their own tools and actively use them to evaluate operations. Perhaps the State could support improvements to these tools and/or integration with State tools.

supply water during times of drought. The studies must be a joint effort of State, federal, and local government, as well as involve other interested parties.

Local leadership and initiative are also needed to implement water transfers. Water transfers are typically proposed by local water agencies and can benefit from local community involvement in the development of these proposals. Some counties have passed local ordinances to regulate groundwater extraction for water transfer purposes. With adequate public notice, timely disclosure of proposals, and meaningful public participation, local communities can best assess their area's water demands and supplies and determine whether there is potential for transferring water outside the local region.

Potential Benefits

For receiving areas, water transfers have the potential to improve economic stability and environmental conditions that would otherwise deteriorate with water scarcity. Sellers can use the compensation from transfers to fund beneficial activities, though there is no guarantee that benefits to the seller will benefit the source area as a whole. Compensation from most transfers involving agricultural water goes directly to the participating landowner, who may choose to reinvest in the farming business. In some cases, compensation goes to water districts, which can use the income to reduce water rates, improve facilities, or improve environmental conditions. For example, Western Canal Water District, in the northern Sacramento Valley, used proceeds from Water Bank sales to remove diversion dams and reconfigure its canals to reduce impacts on threatened spring-run salmon. Transfers by regional water agencies can provide additional resources to benefit the entire community. For example, the Yuba County Water Agency has used more than $10 million from the proceeds of water transfers over the past several years to fund needed flood control projects.

Potential Costs

The direct costs of completing a water transfer include more than just the price of water to the seller. Additional direct costs to the buyer include conveyance, storage, and treatment costs. Sale prices reflect the cost to make the water physically available for transfer and, in some cases, added monitoring or mitigation needed to protect the environment or other legal water users. The buyer typically arranges for transferred water to be conveyed to the area of use. Conveyance costs can be significant, and conveyance losses can lessen the amount of water actually delivered to the receiving area. In addition, there are also administrative costs of the conveyance agency in developing conveyance contracts, including staff time for ensuring compliance with statutory provisions regarding third-party impacts and the development of associated environmental review documents by the transfer proponents.

Another cost related to transferring water is carriage water. Carriage water is the extra water needed to carry a unit of water across the Delta to the pumping plants, while maintaining a constant salinity. For the Sacramento River, this has generally been about 20 percent of the transfer water and for the San Joaquin River about 10 percent. Carriage water is essentially a transaction cost that is negotiated between buyers and sellers. 

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Number: 1 Author: DeviMody Subject: Sticky Note Date: 11/26/2013 1:02:40 PM

It would be worth noting that Delta carriage water losses in 2012 and 2013 were 30%. Also, maybe it occurs with other water transfers, but I have not found carriage water to be "negotiated between buyers and sellers". SCVWD and other south-of-Delta buyers have had to bear the costs of carriage water losses.

Project Feasibility Considerations

One of the roles and goals of California is to seek statewide water supply reliability and sustainability. Similarly, one of the roles and goals of the California Department of Water Resources (DWR) is to strive for sustainable groundwater supplies throughout the state. Conjunctive management is emerging as one major water resources management tools to attain these goals. The five project feasibility considerations of conjunctive management are:

- Hydrogeologic feasibility: Hydrogeologic feasibility takes into consideration the hydrogeologic constraints that must be identified.
  - Where is the recharge zone for the aquifer that is going to be pumped?
  - What is the mechanism and rate of recharge?
  - Is the recharge zone connected to the aquifer that is going to be pumped?
  - What are the soil, sub-soil, and aquifer characteristics – infiltration capacity, porosity, hydraulic conductivity, specific yield – that are important for success of conjunctive management?
- Available groundwater storage capacity: Available groundwater storage capacity denotes the space available to recharge the basin.
- Water source: Water source provides the supply of water that will be used to store water in the groundwater system. Water sources include imported water, local runoff, and treated wastewater.
- Conveyance: Conveyance is necessary to transport the water from water source to recharge location and to distribute water from the groundwater extraction facility to the point of demand. Conveyance systems include lined and unlined canals, pipelines, and streams.
- Recharge and extraction and pre- and post-treatment facilities: Recharge and extraction and pre- and post-treatment facilities are essential components to complete the conjunctive management project. Recharge includes direct spreading, injection, in-lieu recharge, and induced natural recharge. Extraction may be for direct use, pump back to conveyance systems, and surface water exchange.

The five project feasibility considerations of conjunctive management — hydrogeologic feasibility, available groundwater storage capacity, water source, conveyance, recharge and extraction and pre- and post-treatment facilities — are the fundamental, physical elements that are indispensable for conjunctive management to be functional. If any of these physical elements are missing, it will make conjunctive management impractical and unworkable.

Project Development Components

In practical terms, once the five project feasibility considerations are determined to be satisfactory, a set of five project development components must blend together for a specific conjunctive management project or program:

- Groundwater planning and management: Groundwater planning is the process to decide what needs to be accomplished to preserve the natural resource. The outcome of this planning process is a groundwater management plan. Groundwater management denotes the set of activities that direct how to implement management actions identified during the planning step as contained in the groundwater management plan. Formally speaking, groundwater management is the planned and coordinated management of a groundwater basin or portion of a groundwater basin with a goal of long-term sustainability of the resource. Groundwater

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/20/2013 3:08:25 PM

Conjunctive use isn't an "emerging" strategy for agencies like the Santa Clara Valley Water District. We have been relying on conjunctive management for over 80 years.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/20/2013 3:18:37 PM

Pre- and post-treatment may not be necessary for a successful conjunctive use project. The Santa Clara Valley Water District conducts managed recharge in over 300 acres of ponds and 80 miles of creeks using untreated surface water. Groundwater from our basin typically meets drinking water standards without the need for treatment.

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/20/2013 3:18:37 PM

See previous comment. Pre- and post-treatment may not be necessary.

Number: 4 Author: BehzAhma Subject: Highlight Date: 11/21/2013 9:22:10 AM

The groundwater management plan description here should be aligned with Part 2.75 - Groundwater Management of the water code.

management aims to improve specific aspects of the management of groundwater resources in individual basins or portions of basins across a region or throughout the state. The improvements pertain to many aspects of groundwater management, including characterizing and increasing knowledge of individual groundwater basins, identifying basin management strategies or objectives, planning and conducting groundwater studies, and designing and constructing conjunctive management projects.

- Project construction and operation: Project construction and operation may include construction and operation of treatment facilities, conveyance facilities, or spreading basins as well as installation and operation of monitoring, production, and injection wells, and drilling of test holes.
- Institutional structures: As with other types of projects, conjunctive management projects must also adhere to local ordinances in addition to State and federal laws and regulations. Institutional structures include
  - Laws.
  - Regulations and ordinances.
  - Contracts and agreements.
  - Political support.
  - Public-private partnerships.
  - Governance.
- Funding: Funding sources include State and federal grants and loans, State and local bonds, State and local taxes, assessments, and fees, and public-private partnerships. As with other types of projects, a conjunctive management project also has associated cost components, and financing and economics issues. As a result, available sources of funding have to be identified and secured to successfully plan, design, and implement a conjunctive management project.
- Organizational capacity building: Organizational capacity building is the process of equipping entities, usually public agencies, with certain skills or competences, or upgrading performance capability by providing assistance, funding, resources, and training. This is important for the continued operation and long-term success of conjunctive management projects.

The five project development components - groundwater planning and management, project construction and operation, institutional structures, funding, and organizational capacity building - bring a conjunctive management project to Fruition.

Figure 9-1 presents in a nutshell, practical considerations that need to be thought about and met before planning conjunctive management projects and important components for implementing successful conjunctive management projects.

PLACEHOLDER Figure 9-1 Conjunctive Management - Project Feasibility and Development

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Groundwater Storage

Understanding terms related to groundwater storage is critical to ensure the success of a conjunctive management project. Groundwater in storage or simply groundwater storage can be defined as the quantity of water found at a given time in the pore spaces of the alluvium, soil, or rock formation beneath

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/15/2013 11:46:13 AM
Groundwater management also includes the implementation of programs or projects to manage and protect groundwater.

locations or at other times, groundwater may discharge to the stream, contributing to its baseflow. Similarly, degradation of surface water quality may result in a corresponding degradation of groundwater quality. Pollution of groundwater may result in a corresponding pollution of surface water. Thus, changes in either the groundwater or surface water system will directly affect the other. Although this physical interconnection is understood in general terms, details of the physical, chemical, and residence time relationships remain the topic of a number current studies for certain basins by various State and federal agencies. Effective conjunctive management acknowledges the interconnection of the two resources and requires proper characterization of local and regional interconnections to ensure safety and effectiveness for specific programs and projects and to maximize the beneficial uses of the integrated water system (see Box 9-3).

PLACEHOLDER Box 9-3 Groundwater and Surface Water, a Single Source

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Meeting Multiple Objectives

Conjunctive water management projects may be implemented to meet many objectives including improving local or regional water supply reliability, increasing flood protection, meeting environmental needs, improving groundwater quality, countering land subsidence, or reducing groundwater overdraft. One example of conjunctive water management is recharging groundwater storage using surface water when additional surface water supplies are available and affordable. The surface water may be introduced into the aquifer through injection wells, spreading the water on permeable ground surfaces in recharge ponds, or introducing the water into streams that are connected to the aquifer through permeable streambeds. The stored water in the aquifer can then be withdrawn at a later time when surface water is not available or too expensive to meet local demands. In some areas, recharge may be accomplished by providing surface water to users who would normally use groundwater (also called in-lieu recharge), thereby leaving more groundwater in place for restoring groundwater levels or for later use. For further discussion on natural and managed (also called artificial or intentional) groundwater recharge, see Box 9-4.

PLACEHOLDER Box 9-4 Groundwater Recharge: Natural and Managed

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

A sustainable conjunctive water management program consists of several components that include investigating the groundwater aquifer characteristics, estimating surface water and groundwater responses, and appropriate monitoring of groundwater level and quality. In addition, reliable institutional systems for ensuring environmental compliance, providing long-term system maintenance, and managing contractual and legal features of the program are critical to sustainability. An important issue pertaining to legal features of a conjunctive water management program is addressing who actually owns the artificially recharged water in a managed recharge project, particularly if the timing of recharge has prevented natural recharge, which would belong to all the overlying landowners. The major legal issue is how to resolve the ownership/extraction rights related to water that has been artificially added into a multi-jurisdictional/multi-land owner groundwater basin. The question is whether the water that has been artificially added to a groundwater basin is the property of the entity that added it or, once it commingles

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/15/2013 11:56:27 AM
Programs that reduce demands on groundwater such as water conservation and water recycling also serve as in-lieu recharge.

- DWR worked cooperatively with local Monitoring Entities to develop groundwater elevation monitoring programs for their defined monitoring areas.
- DWR developed an online system for a monitoring plan, well information, and groundwater elevation data submittal, which provided public access to this information and data in both tabular and map formats.
- Monitoring Entities began ~~groundwater elevation monitoring and~~ submitting groundwater elevation data to the CASGEM Online System in fall 2011.
- DWR released the CASGEM Online System to the public in mid-November 2011, allowing access to submitted groundwater elevations.
- DWR released the first report of findings of the CASGEM program to the governor and Legislature in January 2012.

On January 1, 2012, Assembly Bill 1152 made revisions to the California Water Code related to the CASGEM Program, which include adding a new Monitoring Entity category, allowing alternative monitoring of groundwater basins, and removing the requirement for DWR to seek concurrence of the State Mining and Geology Board regarding adequacy of monitoring plans to demonstrate seasonal and long-term trends in groundwater elevations.

Data Collection and Management

Statewide data are important in planning and developing the conjunctive water management strategies. The data should include, in addition to those collected as part of the CASGEM Program, groundwater management-related information, groundwater quantity and quality, and water use in the state. DWR's Bulletin 118 series, titled *California's Groundwater*, provides information about the state's groundwater resources and its ~~current~~ resource management practices. Bulletin 118 was last updated in 2003, and unfortunately, it appears unlikely that there will be future funding to continue to update this bulletin. However, without having access to reliable data and analysis on groundwater, the goal to manage this resource better will likely remain unattainable. To respond to this need, as part of Update 2013, DWR has initiated a process to enhance groundwater content in a major way. The objective is to "expand information about statewide and regional groundwater conditions to better inform groundwater management actions and policies through compilation and summarization of data and analysis." This effort will not solve all the statewide and regional issues related to groundwater, but it is intended as a starting point to bring all the available information together from a statewide and regional perspective. The information content on groundwater built through this initiative is anticipated to set the stage for future California Water Plan updates and related activities to provide on a long-term basis additional data, information, and analyses as well as policy needs for California's groundwater planning and management. The major proposed deliverables planned for Update 2013 include the following:

- Consolidated groundwater information from various State, federal, regional, and local water resource planning initiatives.
- Status of regional groundwater conditions, management activities, and problem areas.
- Data gaps to inform future groundwater monitoring needs and activities better.
- Estimates of regional annual change in groundwater storage.
- Illustration of successes and challenges of local and regional management of groundwater through case studies.
- Inventory and potential for conjunctive management of groundwater with other supplies.
- Inventory and potential for groundwater banking and integrated flood management.

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Number: 1 Author: BehzAhma Subject: Cross-Out Date: 11/21/2013 9:25:00 AM

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/15/2013 12:05:04 PM

Agencies such as the SCVWD have monitored groundwater levels for many decades. This implies monitoring entities didn't monitor levels before CASGEM.

Number: 3 Author: BehzAhma Subject: Cross-Out Date: 11/26/2013 4:43:38 PM

Bulletin 118 is outdated and does not provide current information and there are no mechanism to keep it up to date.

Number: 4 Author: vanereym Subject: Sticky Note Date: 11/27/2013 9:25:33 AM

This statement does not apply to all areas of the State. Even without an updated Bulletin 118, agencies such as the SCVWD continue to collect and analyze groundwater data, and proactively and effectively manage local groundwater resources.

Number: 5 Author: vanereym Subject: Sticky Note Date: 11/27/2013 9:25:50 AM

The issue with statewide efforts of this magnitude is that they are incredibly time consuming and may be outdated by the time they are completed. Even within the CA Water Plan, there are numerous references to groundwater information in Vol 4, which will not be available until the remainder of the Water Plan is complete.

Many agencies such as the SCVWD collect extensive data and regularly report the findings and interpretations through publicly available reports. State efforts should focus on unmanaged basins where little to no data is available.

- Preliminary indicators to assess groundwater sustainability.

The data and analyses resulting from the above deliverables were consolidated into a report, *California's Groundwater – Update 2013*, that is available online in *Update 2013 Volume 4, Reference Guide*. The information also provided groundwater related contents for *Update 2013 Volume 1, The Strategic Plan and* Volume *2, The Regional Reports*.

The Integrated Water Resources Information System (IWRIS), released by DWR in 2008, is the first centralized water data management system developed to help local and regional water management entities integrate and analyze existing data about their groundwater system and potential value of current groundwater management in their integrated planning processes. It serves as a centralized information system for accessing the data about groundwater as well as groundwater management and some DWR grant program funding statewide. Figure 9-2, generated from DWR IWRIS, shows a distribution of the AB 303 Grants from 2001 to 2008 for helping the development of groundwater management plans which in recent times often include conjunctive management as an important strategy for managing groundwater. Due to a lack of funding, the future of IWRIS remains uncertain. Fortunately, DWR has undertaken a project, Water Planning Information Exchange (Water PIE) that may subsume IWRIS. The ultimate goal of Water PIE is collecting and sharing data and networking existing databases and Web sites using GIS software to improve analytical capabilities and developing timely surveys of statewide land use, water use, and estimates of future implementation of resource management strategies. Phase I of Water PIE has been initiated, which is intended to develop the business and technical requirements for the web-based system. In Phase 2 of Water PIE, a pilot application will be conducted to assess the developed system and refine requirements and design before full implementation commences.

PLACEHOLDER Figure 9-2 Distribution of the AB 303 Grants from 2001 to 2008

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Although the groundwater elevation monitoring provisions of the CASGEM Program are steps in the right direction, there is no comprehensive statewide data-monitoring network for planning and implementing conjunctive management. The availability of information is increasing as local and regional water management entities analyze the existing and potential value of active groundwater management in their integrated planning processes. It is important to have updated information on the various conjunctive water management planning and implementation activities statewide to achieve better coordination among future conjunctive water management planning activities and to avoid potential conflicts. DWR has started developing a state[1] inventory of conjunctive management agencies and projects that is included in Update 2013. Detailed information on the inventory is available online in *Update 2013 Volume 4, Reference Guide – California's Groundwater Update 2013*. This initial effort in Update 2013 was not as successful as intended because of the reluctance of local and regional water agencies to release data to build such an inventory. The reluctance of these agencies to provide information emanated primarily from an apprehension about uncertainty in State regulations pertaining to groundwater recharge. This inventory will continue to be updated, refined, and expanded in future California Water Plan updates.

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/27/2013 9:28:07 AM

Detailed information on groundwater and conjunctive management efforts is already reported by groundwater management agencies such as the SCVWD through publicly available reports. Limited state resources would be better spent trying to address known issues rather than compiling information that is sure to be outdated by the time it is reported. For example, DWR staff reviewed the SCVWD 2001 Groundwater Management Plan instead of the SCVWD 2012 Groundwater Management Plan due to the DWR review cutoff date.

Note that Vol 4 is not available online at this time, although it is referenced in many sections of the CA Water Plan currently available for review.

Number: 2 Author: trachemm Subject: Comment on Text Date: 12/2/2013 3:15:22 PM

What data was requested? How was it requested? How did DWR determine local agencies were reluctant to provide information? More information should be provided if you are going to say local agencies aren't cooperating.

Also, sometimes it is difficult to understand what is being requested and why. For instance, SCVWD has been doing conjunctive use for 80+ years. That is how we manage our system. We don't think of it as a "project."

should generally be geared toward ensuring that new developments incorporate detention ponds so that the increased runoff and lost natural recharge can be offset by the planned detention ponds, accomplished in such a way that groundwater quality is not compromised. However, instead of this approach and if workable, an alternative basin-wide or watershed-scale approach may also be taken to mitigate the effects of new developments in a more cost-effective way at the basin or watershed level. The proposed detention ponds can provide flood protection and also help maintain natural recharge. Managed recharge facilities may be used to inject the increased runoff to the underlying groundwater basin. One significant initial step in this direction was the passage of AB 359 in 2011, which requires local groundwater agencies to include a map in groundwater management plans that identifies groundwater recharge areas in their basins and to provide these recharge area maps to local planning agencies. The issues related to land use and recharge area protection are further discussed in Chapter 20, "Urban Stormwater Runoff Management" and Chapter 25, "Recharge Area Protection" in this volume.

Recently, Calaveras County has added a new dimension to the on-going discussion of land and water use nexus by introducing the concept of water element in its general plan. The county defines a water element as "a self-contained document that identifies and articulates goals, policies, and objectives for the multiple uses of water. It can address all or some of these uses, such as water supply, wastewater, water quality, stormwater management, flood management, watershed management, protection of habitat, and erosion control. It does not dictate land use planning; it informs land use planning." The goal as articulated by the county is "by integrating these various aspects in a Water Element there will be greater opportunity for improving the linkage between land use decisions and water planning; standardizing services; increasing public awareness; and…." (Montgomery Watson Harza 2009).

Inconsistency and Uncertainty in Regulatory Status with Respect to Recharge and Surface Commingling of Different Quality Water

Groundwater recharge involves using water from various sources to recharge a groundwater basin. The quality of water used for recharge is usually different from the water in the receiving groundwater basin. Uncertainty in regulatory status with regard to the quality of recharging and receiving waters increases the uncertainty in the planning effort of conjunctive management and may increase cost or even make a conjunctive water management project infeasible during implementation.

Lack of Data and Tools

Data and tools are very important in developing a reliable and advanced conjunctive water management strategy. Data are needed to understand the groundwater resource, to monitor and measure the progress of water management strategies, and to calibrate and validate computer modeling tools. However, data are often lacking. Tools are also not readily available for use and may need to be developed. Existing tools may also need to be refined and improved, as discussed later in this section.

Data are needed to evaluate conditions and trends laterally and vertically in a geographic area and over time. The CASGEM Program has been implemented to monitor groundwater elevations and the Groundwater Ambient Monitoring and Assessment Program (GAMA) has been implemented to monitor groundwater quality. Besides these two programs, there are few comprehensive basin-wide networks to monitor groundwater levels, water quality, land subsidence, and interaction of groundwater with surface water and the environment. There is no centralized database or integ[dt: 1] information system providing access to various groundwater monitoring networks operated by various State and local agencies. DWR

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/19/2013 9:17:38 AM

Why is a centralized, statewide database needed? Groundwater management is most effective at the local or regional level, and many groundwater management agencies conduct extensive monitoring and reporting on basin conditions through reports available to the public.

The state should be focusing on improving monitoring and analysis where data is lacking, not compiling data in well-managed areas.

released the first such product called the Integrated Water Resources Information System (IWRIS) in May 2008 to the public, but IWRIS does not include or provide access to much of the available water quality data.

To understand the groundwater resources on a statewide basis, data from throughout the state are needed. Although data in remote areas may not be available because remote areas are not usually monitored by local authorities, these data are important for understanding the statewide groundwater system. A statewide groundwater modeling tool can help identify cost-effective and necessary locations and frequency of groundwater monitoring. An integrated statewide data and information management system such as IWRIS can also help visually identify the spatial data gaps in the state. Because of the lack of resources, incentives, or conflicts of interest, individuals or local agencies are usually not able to fill the spatial data gaps outside their management areas. State agencies could help fill the data gaps by providing the necessary resources to local agencies. Better cooperation and coordination are also needed among the agencies to best use available resources to develop a statewide groundwater monitoring program by minimizing data gaps and overlaps. The greatest obstacle to the continuation and success of any data program is the lack of dedicated funding for program execution by State agencies and participating local agencies. Success of these important data monitoring programs can only be ensured through long-term commitment and funding at the State and local levels.

One important aspect in data collection effort that is often overlooked is its coordination with the development of computer models. Computer models help identify potentially critical data collection locations (stations) and the desired frequency of collection, leading to improved monitoring of groundwater systems and performance measurement of management strategies. The coordination between data collection and model development would also help improve model calibration and reduce cost of data collection by minimizing data gaps and overlaps. While a model may have its own set of limitations, an easy-to-use computer aided conjunctive management tool is needed for assessing the management strategies and quantifying the values of the strategies. The tool should allow managers to define and prioritize objectives and specify constraints in an easy-to-use interface. The tool should also be able to perform integrated surface water and groundwater modeling, land subsidence analysis, and economic evaluation.

Computer models have been developed to assist water resources planning and management and there is continued development of these models. CalSim II (Close et al. 2003), jointly developed by DWR and the U.S. Bureau of Reclamation, is a recognized water resources planning model for SWP and CVP operations running in monthly time step. Groundwater models are also under development for selected hydrologic regions. One of the groundwater models covering the Central Valley is the California Central Valley Groundwater-Surface Water Model (C2VSim). It simulates three groundwater layers and model calibration was recently completed (Brush 2013). The model was officially released in June 2013. A similar model, called the Central Valley Hydrologic Model (CVHM), was developed and released by the U.S. Geological Survey (Faunt 2009). However, before either C2VSim or CVHM can be used for local groundwater management, its modeling resolution needs to be improved. Effort to improve the spatial resolution of C2VSim has commenced recently. Availability of a model with finer spatial resolution is extremely important because while the State's goal is to encourage conjunctive water management statewide, the effects of bad management are felt locally by citizens dependent on groundwater. While many areas in the state rely on surface water or has access to surface water, in some areas more than 70%

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Number: 1 Author: BehzAhma Subject: Highlight Date: 11/26/2013 4:45:00 PM
A statewide modeling tool most likely will not have enough resolution to assist in improving groundwater monitoring at the local level.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/26/2013 3:42:10 PM
The identification of monitoring locations and frequency to meet local needs is best achieved at the local level. State funding should be focused on areas where monitoring is lacking or could be improved.

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/26/2013 4:35:15 PM
A tool that provides realistic or useful results for all these areas will require a significant amount of data. Since this data will likely originate from local agencies, this type of modeling is best left to the local or regional level.

of the agriculture is groundwater dependent, as documented and available online in *Water Plan Update 2013 Volume 4, Reference Guide – California's Groundwater Update 2013*.

A recently published report documents a planning level analysis performed to assess and quantify general viability of conjunctive water management projects in the Sacramento Valley. The analysis was conducted by sequentially using a simplified surface water model in conjunction with CalSim-II to simulate CVP/SWP operations and SacFEM based on MicroFEM (Hemker 2013) to assess impacts of proposed projects on groundwater levels and streamflows. The analyses provided a general estimate of potential benefits resulting from the proposed projects. However, the report notes that the analysis will need to be refined for specific project implementation by clearly incorporating infrastructure and operational protocols and analyzing response of the simulated surface and groundwater water system (CH2MHill and MBK Engineers 2010)

A recent effort to integrate C2VSim with an updated version of CalSim II called CalSim III (California Department of Water Resources 2013d), may offer a broader water resources modeling system and provide an opportunity for developing an integrated groundwater and surface water modeling system for the entire state (Ling 2007; Joyce 2007). To be a good conjunctive water management tool, more modeling capabilities need to be added and integrated in the modeling system. Modeling capabilities that need to be added are:

- Water temperature modeling.
- Daily time step modeling of CalSim instead of monthly time step.
- A user-friendly interface.
- Capability to specify management objectives and constraints.
- Groundwater modeling beyond the Central Valley to cover possible salt water intrusion and address groundwater issues relevant to other hydrologic regions.
- Environmental and economic analysis.

Other available models or modeling system also lack these capabilities. As conjunctive management is sensitive to the temperature shifts as well as the type, amounts, and patterns of precipitation that affect the hydrologic system, model refinements must also allow incorporation of variable climatological scenarios to provide confidence in its projections for conjunctive management. Although there has been recent increased effort to do that, these refinements need to be further improved to ensure that climate change projections are properly reflected in model simulations.

The lack of data and tools to evaluate the groundwater and surface water interaction has hindered conjunctive water management and water transfer practices because of the failure to quantify compensations to injured parties. The inability to identify the impact of groundwater pumping on surface water and aquatic ecosystems fully, adds to the risk of effective conjunctive water management planning. To overcome this hurdle, sufficient funding must be committed to State agencies and where applicable, local and regional agencies to ensure that the required data and tools are incrementally developed and refined.

Public Access to Well Completion Reports

Although there are many wells in the state, the well completion reports are not accessible to the public because of confidentiality requirements (California Water Code Section 13752). If the relevant California

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/26/2013 3:46:52 PM
A statewide tool may be useful for general planning purposes, but the investigation of local and regional groundwater conditions is best done at the local level. The state can support these efforts with funding or technical tools.

unmanaged groundwater use will eventually affect other water users and may have significant impacts on the environment and economy. Incomplete understanding of these connections can lead to unintended consequences if projects are designed and built to increase groundwater extraction without adequate safeguards to forestall the potential adverse impacts.

Because most groundwater systems are slow responding systems, any damage to the system may require long periods to recover and any effects on third parties may take a considerable time to reach detectable levels. Planning, monitoring, evaluating, and maintaining a management structure that is able to react to unplanned consequences are keys for successful groundwater management. Sustainable conjunctive water management is an important strategy to deal with the existing and future water supply challenges. Management of the entire groundwater basin or hydrologic region is essential for effective conjunctive water management. Conjunctive management will be more effective and efficient if multiple hydrologic regions work together so that the weaknesses and strengths of regions can be coordinated and used for mutual benefit. However, the existing legal and regulatory framework on groundwater use will make it very difficult to plan any large-scale conjunctive water management strategies because groundwater management is a local responsibility (Sax 2002). Under this legal framework, the conjunctive management strategy that can be pursued with minimal effort is limited to groundwater recharge at the local level with local surface water. The State's role in conjunctive management is limited to providing funding to help willing local agencies plan and implement conjunctive management.

Most groundwater management ordinances restrict out-of-county groundwater uses. Some groundwater management plans specify trigger levels for groundwater levels in the basin management objectives (BMOs) to prevent overdraft or water quality problems. However, in many cases there are no mechanisms to address the non-compliance with the BMOs. The current groundwater ordinances, AB 3030 and SB 1938 groundwater management plans and local BMO activities, which were intended for localized groundwater management, appear not to be well suited for implementing regional groundwater management. Recent development in water planning through the collaborative IRWM framework may, however, pave a way to increase cooperation and collaboration among local and regional water entities to design and implement regional conjunctive management programs and projects that will preserve and promote the interests of all stakeholders. Legal and scientific ways of settling the issue of ownership/extraction rights in a multi-jurisdictional/multi-land owner groundwater basin would be a crucial hurdle to overcome to make regional conjunctive management projects viable and successful.

W[1] Quality

Groundwater quality can be degraded by naturally occurring or human-introduced chemical constituents, low quality recharge water, or chemical reactions caused by mixing water of differing qualities. Protecting human health, the environment, and groundwater quality are all concerns for programs that recharge urban runoff or recycled water into groundwater. The intended end use of the water can also influence the implementation of conjunctive management projects. For example, agriculture can generally use water of lower quality than is needed for urban use, but certain crops can be sensitive to some constituents such as boron.

New and changing understanding of water quality constituents, including emerging contaminants and their risks to human and ecological health, result in changing water quality standards. While this may lead to more healthful water supplies, it also adds uncertainty to planning and implementing conjunctive

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/26/2013 4:45:39 PM
Recharge water can also improve groundwater quality - for example, the recharge of surface water with low nitrate will lower the nitrate in groundwater.

2. Improve collaboration and coordination among State, federal, tribal, local, and regional agencies and organizations to ensure data integration, coordinate program implementation, and minimize duplication of efforts.

By January 1, 2017, and on an ongoing basis, DWR and the SWRCB will coordinate with State, federal, tribal, local, and regional agencies and organizations to conduct the following activities.

A. Provide State incentives to local water management agencies to coordinate with Tribes and other agencies involved in activities that may affect long-term sustainability of water supply and water quality.

B. Outline and implement process to improve coordination and cooperation among State, federal, tribal, and local agencies to improve the process for timely regulatory approval, alignment of rules or guidelines, and environmental permitting for the development, implementation, and operation of conjunctive management, recharge, and water banking facilities.

C. Expedite environmental permitting for implementation of conjunctive management, recharge, and water banking facilities when facility operations increase ecosystem services, and includes predefined benefits/mitigation for wildlife and wildlife habitat.

D. Establish a process led by the SWRCB to identify measures whereby agencies proposing to use peak surface water flow for groundwater recharge are not subject to potential protest of their existing water right, in order to stipulate groundwater recharge as a reasonable beneficial use of their surface water right.

3. Increase availability and sharing of groundwater information.

DWR will coordinate with State, federal, tribal, local, and regional agencies and organizations to conduct the following activities.

A. By January 1, 2016, Governor's Office of Planning and Research (OPR) will develop a coordination plan to disseminate groundwater information.

B. By January 1, 2016, the State of California will consider changes to Section 13752 of the California Water Code to improve public access to Well Completion Reports, while addressing key infrastructure security and private ownership concerns. The relevant State agencies will be appropriately funded to implement the directives of the legislature in the changed law.

C. By January 1, 2018, State agencies will work collaboratively with water agencies, local permitting agencies, and driller organizations to i) develop an on-line Well Completion Report submittal system, ii) digitize and make publically available existing Well Completion Reports to allow improved analysis of groundwater data, and iii) build upon efforts begun in 2012 to update well drilling, construction, and abandonment standards.

D. By December 31, 2018, DWR will work with SWRCB to implement a web-based Water Planning and Information Exchange (Water PIE) system that will provide on-line access to groundwater supply and demand information, groundwater level and quality data, groundwater recharge and conjunctive management activities, groundwater management planning, land subsidence information, and groundwater basin studies.

4. Strengthen and expand the CASGEM Program for its long-term sustainability.

A. By January 31, 2015, and renewable in each five-year cycle ending in 8 and 3, the State of California will commit long-term, dedicated funding to the CASGEM Program to implement

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:29:35 AM

What type of groundwater information? Again, many agencies already collect extensive groundwater data and report the findings through publicly available reports. What is the benefit of using limited state resources to re-disseminate this data (or in this case, develop a plan to re-disseminate the data)?

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/19/2013 9:25:44 AM

Assuming legislative efforts related to item B are successful.

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/19/2013 9:26:09 AM

Agencies such as the SCVWD already prepare regular comprehensive reports summarizing groundwater conditions based on extensive collected data. Also, many agencies are already reporting water level data to the state via CASGEM.

Any statewide effort should minimize the reporting burden on local agencies.

monitoring, assessment, and maintenance of baseline groundwater levels data, and expand the program to include the fractured rock hydrogeology in areas deemed important.

B. By January 31, 2015, and renewable in each five-year cycle ending in 8 and 3, the State will continue funding for local groundwater monitoring and management activities, and feasibility studies that increase the coordinated use of groundwater and surface water by giving priority to projects that include filling regional and Statewide data gaps and conjunctive management conducted in accordance with an IRWM plan. Thus encourage or require and provide incentives to local water management agencies to implement groundwater monitoring programs to provide additional data and information needed to adequately characterize a groundwater basin, subbasin, aquifer or aquifers under the jurisdiction of the agency or adopted groundwater management plan. Box 9-9 lists the items that a data collection program should include.

C. By December 31, 2018, the State will expand and fund CASGEM by including and implementing above recommendations as integral components of the Program, and thus use CASGEM as the vehicle to update and maintain groundwater information in the future.

PLACEHOLDER Box 9-9 Components of A Data Collection Program

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

5. Under the CASGEM Program, improve understanding of California groundwater basins by conducting groundwater basin assessments of CASGEM high priority basins in conjunction with the California Water Plan (CWP) five-year production cycle.

By December 31, 2018, DWR will coordinate with State, federal, tribal, local, and regional agencies to utilize the CASGEM Basin Prioritization information to conduct the following groundwater basin assessment activities.

A. Develop the initial and reoccurring schedule and scope for groundwater basin assessments that will allow data and information sharing under the CWP five-year production cycle.

B. Compile and evaluate new and existing groundwater supply and demand information, groundwater level and quality data, groundwater recharge and conjunctive management activities, surface water/groundwater interaction, groundwater management planning, land subsidence information, and existing groundwater basin studies, in accordance with the scope identified in (a).

C. Develop detailed groundwater basin assessment reports by Hydrologic Region and groundwater basin. The reports will characterize sustainability of groundwater resources in terms of historical and existing trends and future scenario projections, and will identify recommended incentives to establish basin-wide groundwater budgets and adaptive management practices which will promote sustainable groundwater quantity, quality, and the maintenance of groundwater ecosystem services. Box 9-10 lists the inflow and outflow components that make up a groundwater budget.

D. Develop a summary report to California Legislature depicting the State of California's Groundwater which will highlight key findings and recommendations associated with detailed groundwater basin assessments by Hydrologic Region.

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/26/2013 4:46:40 PM
These assessments may be outdated by the time they are completed due to the significant effort involved. If most high-priority basins are actively managed, the state should not duplicate information already being reported by those agencies.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/15/2013 2:18:51 PM
The SCVWD regularly collects and evaluates data to report on the issues identified here.

Any additional reporting burden to local agencies should be minimized. This is particularly true for well-managed basins such as those in Santa Clara County.

Number: 3 Author: trachemm Subject: Sticky Note Date: 11/27/2013 10:34:29 AM
These reports should rely on existing local groundwater management agency reports when the the local reports are available.

PLACEHOLDER Box 9-10 Components of A Groundwater Budget

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

6. **Conduct an assessment of all SB 1938 groundwater management plans and develop guidelines to promote best practices in groundwater management.**

   In coordination with State, federal, tribal, local, and regional agencies, DWR will conduct the following activities.

   A. By January 1, 2015, the Legislature will amend the appropriate code(s) to authorize DWR to evaluate and assess groundwater management and planning, and to develop groundwater management and implementation guidelines.

   B. By January 1, 2016, DWR will conduct outreach to local and regional agencies to supplement and verify Groundwater Management Plans (GWMP) inventory and information initiated by DWR as part of Update 2013.

   C. By January 1, 2017, DWR will work with regional and local agencies to assess their GWMP implementation and practices, in accordance with existing California Water Code requirements to i) identify technical, legal, institutional, physical, and fiscal constraints associated with existing groundwater management programs, ii) identify opportunities associated with groundwater management and planning activities, and iii) gain an understanding of how agencies are implementing actions to use and protect groundwater.

   D. By January 1, 2018, DWR will work with regional and local agencies to develop groundwater management and planning and program implementation guidelines. The guidelines will provide a clear roadmap for GWMP development and implementation by identifying and clarifying components, processes, and standards and by establishing provisions for periodic review, report, update, and amendment as necessary to facilitate effective and sustainable groundwater management. The guidelines will also emphasize groundwater management in coordination with or as part of an IRWM plan.

   E. By December 31, 2018, DWR will convene a GWMP Advisory Committee and begin coordination with regional and local agencies and tribal communities that have not developed basin-wide GWMPs, to develop such plans with assistance and guidance from the GWMP Advisory Committee. The GWMP Advisory Committee will help guide the development, educational outreach, and implementation of the GWMPs. Advanced tools development should be pursued as part of this activity to help quantify benefits and assess robustness of alternative management strategies.

7. **Develop analytical tools to assess conjunctive management and groundwater management strategies.**

   By December 31, 2018, DWR and the SWRCB, in collaboration with State, federal, tribal, local, and regional agencies will conduct the following activities.

   A. Develop a conjunctive management tool that will help identify conjunctive management opportunities (projects) and evaluate implementation constraints associated with the i) availability of water for recharge, ii) available means to convey water from source to destination, iii) water quality issues, iv) environmental issues, v) jurisdictional issues, vi) costs and benefits, and vii) the potential interference between a proposed project and existing projects.

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:13:15 AM
DWR already has this authority. The state focus should be ensuring that local agencies are well-equipped to sustainably manage groundwater resources.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/27/2013 9:40:29 AM
This should be a first step. Based on the outreach, DWR can better determine the best path for moving forward by better understanding where and what the needs are.

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/27/2013 9:39:26 AM
DWR does not need to assess the GWMP implementation and practices in well-managed basins. State efforts should focus on unmanaged basins.

Number: 4 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:18:00 AM
DWR's existing guidelines and State law provide sufficient guidance for many agencies. DWR should focus on unmanaged and poorly managed basins.

Number: 5 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:18:57 AM
This should be the focus of state efforts and work should begin immediately.

Number: 6 Author: vanereym Subject: Sticky Note Date: 11/15/2013 2:21:28 PM
This evaluation is best done at the local level. The state can support this with funding or technical tools.

B. The State will encourage or require local and regional agencies to develop or adopt analytical tools to support integrated groundwater/surface water modeling and scenario analysis for assessing alternative groundwater management strategies as part of their IRWM planning activities.

8. Increase Statewide groundwater recharge and storage by two maf (current average annual Statewide groundwater use is about 16 maf).

The following activities will occur through coordination among State, federal, tribal, local, and regional agencies.

A. By January 1, 2016, the Legislature will revise the Water Code to i) include disincentives to overdraft groundwater basins and ii) include incentives for increasing recharge.

B. By January 2017, DWR will compile, assess, and provide status update on Statewide aquifer recharge area delineation and mapping required by AB 359 and to identify priority recharge areas.

C. By January 1, 2017, State agencies will work with federal, Tribal, local, and regional agencies to i) develop guidelines clarifying interagency alignment and improved interagency coordination to facilitate local groundwater recharge and storage projects, ii) develop guidelines for coordinating and aligning land use planning with groundwater recharge area protection, and iii) catalogue best science and technologies applied to groundwater recharge and storage.

D. By January 1, 2018, DWR and SWRCB will compile available data, identify missing data needed to evaluate natural groundwater recharge, discharge, related ecosystems, and groundwater recharge and storage projects, and develop a plan to fill identified data gaps to support evaluation of groundwater recharge and storage.

By January 1, 2018, and on an ongoing basis, the State will encourage local and regional agencies - when technically, legally, and environmentally feasible – to manage the use of available aquifer space for managed recharge and develop multi-benefit projects that generate source water for groundwater storage by capturing water not used by other water users or the environment.

F. By December 31, 2018, the State will encourage and fund local and regional agencies, and tribal communities to i) identify and evaluate local and regional opportunities to reduce runoff and increase recharge on residential, school, park, and other unpaved areas, ii) coordinate groundwater recharge and multi-benefit flood control projects to enhance recharge using storm flows, and iii) conduct pilot studies (one regional and one inter-regional) to identify additional opportunities and needs for advancing recharge opportunities.

9. Evaluate reoperation of the State's existing water supply and flood control systems.

In collaboration with willing participants, DWR will complete a System Reoperation Study by 2015. The study will evaluate and document the potential options for reoperation of the State's existing water supply and flood control systems to achieve the objectives of improved water supply reliability, flood hazard reduction, and ecosystem protection and enhancement. The reoperation options will focus on integrating flood protection and water supply systems, reoperating the existing water system in conjunction with effective groundwater management, and improving existing water conveyance systems.

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Number: 1 Author: trachemm Subject: Sticky Note Date: 11/27/2013 10:41:43 AM
This should be the focus of the recommendations for this section. Many of the recommendations are centered on collecting and analyzing data. While this is an important part of a conjunctive use program, there also needs to be action.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:23:11 AM
It is unclear why it will take so long to provide this status update. Also, the State should focus on actions rather than additional reporting.

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:24:12 AM
I'm not sure why this can't happen until 2018. The State should be encouraging additional recharge now and can provide support through funding.

Box 9-4 Groundwater Recharge: Natural and Managed

Groundwater recharge is the mechanism by which surface water moves from the land surface, through the topsoil and subsurface, and into the aquifer, or through injection of water directly into the aquifer by wells. Groundwater recharge can be either natural or managed. Natural recharge occurs from precipitation falling on the land surface, from water stored in lakes, and from streams carrying storm runoff (Figure A). Managed recharge occurs when water is placed into constructed recharge or spreading ponds or basins, or when water is injected into the subsurface by wells. Managed recharge is also known as artificial, intentional, or induced recharge. Two widely used methods for managed groundwater recharge are recharge basins and injections wells. An additional, indirect method of managed recharge is called in-lieu recharge.

Recharge Basins. Recharge basins are frequently used to recharge unconfined aquifers. Water is spread over the surface of a basin or pond in order to increase the quantity of water infiltrating into the ground and then percolating to the water table. Recharge basins concentrate a large volume of infiltrating water on the surface. As a result, a groundwater mound forms beneath the basin. As the recharge starts, the mound begins to grow. When the recharge ceases, the mound recedes as the water spreads through the aquifer (Figure B). The infiltration capacity of recharge basins is initially high, and then as recharge progresses, the infiltration rate decreases as a result of surface clogging by fine sediments and biological growth in the uppermost layer of the soil. It has been found that the operation of recharge basins with alternating flooding and drying-out periods maintains the best infiltration rates. Fine surface sediments may occasionally need to be removed mechanically to maintain the effectiveness of recharge basins.

Injection Wells. Injection wells are used primarily to recharge confined aquifers. The design of an injection well for artificial recharge is similar to that of a water supply well. The principal difference is that water flows from the injection well into the surrounding aquifer under either a gravity head or a head maintained by an injection pump (Figure C). As a large amount of water is pushed through a small volume of aquifer near the well face, injection wells are prone to clogging, which is one of the most serious maintenance problems encountered. Clogging can occur in the well perforations, in the well-aquifer interface, and in the aquifer materials. It is suspected that a combination of a build-up of materials brought in by the recharging water and chemical changes brought about by the recharging water are the primary causes of clogging. The most economical way to operate artificial recharge by injection consists of using dual purpose wells (injection and pumping) so that cleaning of the well and the aquifer may be achieved during the pumping period. However, pretreatment of the water to be injected is always necessary to eliminate the suspended matter.

In-lieu Recharge: In some areas, "recharge" may be accomplished by providing surface water to users who would normally use groundwater, thereby leaving more groundwater in place for restoring groundwater levels or for later use. This indirect method of managed recharge is known as in-lieu recharge.

Another widely used method for managed recharge is through release of water into streams beyond what occurs from the natural hydrology (Figure D). Significant amounts of recharge can also occur either intentionally or incidentally from applied irrigation water and from water placed into unlined conveyance canals.

The major purpose of managed recharge is to increase water supply in an area by supplementing the existing groundwater supply. The use of managed recharge to enhance the availability and quality of groundwater has received increased attention in recent years. Numerous managed recharge projects have been implemented in California and others are planned.

PLACEHOLDER Figure A,B,C,D Groundwater Recharge: Natural and Managed

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Number: 1 Author: vanereym Subject: Sticky Note Date: 11/19/2013 8:41:24 AM
Managed recharge also includes the addition of surface water to creeks to increase percolation through streambeds.

Number: 2 Author: vanereym Subject: Sticky Note Date: 11/19/2013 8:46:31 AM
Suggest renaming this to "Recharge Basins and Managed Releases to Streams"

Number: 3 Author: vanereym Subject: Sticky Note Date: 11/19/2013 8:45:24 AM
In-lieu recharge should also mention water conservation and recycling programs, which reduce demands on groundwater and have the same effect in restoring gw levels as the provision of surface water.

Number: 4 Author: vanereym Subject: Sticky Note Date: 11/19/2013 8:47:01 AM
Suggest moving this to first section rather than in-lieu as this is also direct recharge.

Box 9-6 Conjunctive Management Case Study 2 in Northern California

The Santa Clara Valley Water District (SCVWD) is the comprehensive water management agency for the residents of Santa Clara County. It supplies clean and safe water, manages local groundwater basins, implements flood protection projects and provides watershed stewardship. It serves approximately 2 million people — 1.8 million residents and 200,000 commuters — in 15 cities and unincorporated areas in the 1,300-square-mile county (SCVWD 2008).

Similar to many other parts of California, the areas served by the SCVWD also witnessed remarkable agricultural and urban development in the last two centuries. These developments began in the latter half of the 19th century post-Gold Rush era and continued throughout the 20th century. The intense urban and agricultural growth resulted in increased groundwater extraction, which in turn, culminated in groundwater level declines of more than 200 feet and land subsidence of nearly 12 feet. To meet the water needs in the valley, in the late 1920s the SCVWD (or its predecessor) was formed (SCVWD 2009). This set in motion a long succession of facilities ~~construction~~ for surface storage to increase water supply availability and recharge [2] [3] facilitate conjunctive management through managed groundwater recharge. Since the 1960s, the SCVWD has imported surface water to meet growing demands and reduce dependence on groundwater supplies. Currently, the SCVWD operates and maintains 18 major recharge systems, which consist of both instream and offstream facilities. Local reservoir water and imported water are released in more than 90 miles of more than 30 local creeks for managed instream recharge. In addition, the SCVWD releases locally conserved and imported water to 71 recharge ponds, which range in size from less than 1 acre to more than 20 acres; the total area of the groundwater recharge ponds is more than 400 acres (SCVWD 2012). Through these streams and recharge ponds, the SCVWD recharges the groundwater basin with about 156,000 acre-feet of water each year (Parker 2007). Figure A illustrates how a conjunctive management approach through SCVWD's recharge programs, imported water deliveries, and treated water programs has resulted in remarkably improving groundwater conditions in the basin (SCVWD 2012).

PLACEHOLDER Figure A Conjunctive Management Case Study 2 in Northern California

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Number: 1 Author: vanereym Subject: Inserted Text Date: 11/19/2013 8:48:56 AM
constructed

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through

Number: 3 Author: vanereym Subject: Inserted Text Date: 11/19/2013 8:49:24 AM
and streams

Number: 4 Author: vanereym Subject: Sticky Note Date: 11/27/2013 10:26:26 AM
Per the SCVWD 2012 Groundwater Management Plan, the annual recharge capacity is about 144,000 AF. However, the amount of water recharge depends on available supplies and other factors. Managed recharge over the last few years is approximately 100,000 AF per year.

Number: 5 Author: vanereym Subject: Inserted Text Date: 11/19/2013 8:53:41 AM
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